The Study of Dielectric Properties of Polycaproamide-Polyethylene Mixtures

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Recently interest in the advent of materials with designated physicochemical properties has grown. In this respect, the preparation of polymer composites obtained by mixing two or more polymers is very promising. This work was devoted to the study of dielectric relaxation processes in the composites, created on the base of polar polycaproamide and nonpolar polyethylene. At first, the dielectric properties of pure homopolymer compounds were studied, and next the properties of its mixtures.

We measured the dielectric constant E' and absorption index E" in a wide range of temperature (120-360 K) on four frequencies (0.4; 1.0; 4.0, and 10 kHz) at various compositions of polycaproamide-polyethylene. The polar amide group (-NH – CO-) of polycaproamide with 3.7D dipole moment forms the intermolecular hydrogen bond, which may essentially change the system's properties. The growth of absorption index E'' with increasing temperature was obtained on the graphs of the temperature dependence for E' and E''. However, the $tg\delta(T)$ function reaches three maxima in the process of the growth and its values depend on the frequency.

The first high-temperature maximum was attributed to the process of amorphous phases glass-formation, the second to the rupture of intermolecular dipole-dipole C = 0 bond, and the third low temperature maximum to the rupture of the weak hydrogen bond in caproamide. We have obtained the activation energies for each of these three relaxation processes.